Remarks/Arguments:

I. Status

The Board of Patent Appeals and Interferences decision dated October 31, 2007 (the "Decision"), has been carefully reviewed. Claims 1-3, 5, 7, 9, 15-17, 19, and 21-23 have been amended and claims 1-28 are pending in this application. Reconsideration of this application is respectfully requested.

II. Amendments

Claims 1-3, 5, 7, 9, 15-17, 19, and 21-23 have been amended. In addition to the correction of various informalities, each of the independent claims (claims 1, 9, 15 and 23) have been amended to clarify that the present invention is directed to the determination of thickness of a substrate while the substrate is moving.

III. 35 U.S.C. § 112 Rejection

The Board entered a new rejection in the Decision of claims 1-28 under 35 U.S.C. § 112 for failing to particularly point out and distinctly claim the invention. (Decision at page 6). Specifically, the Board construed the term "high speed image" to include a word of degree and determined that they were unable to ascertain the metes and bounds of a "high speed image" because there were "no express definitions of "high speed imaging" or of an "acquired high speed image" to differentiate those claims from the prior art." (Decision at page 6).

As noted by the dissent in the Decision, even if the term "high speed" as used in the specification is a term of degree, "the definiteness of claim terms depends upon

whether those terms can be given any reasonable meaning." (Decision at page 8, citing to *Young v. Lumenis, Inc.*, 492 F.3d 1336, 1346 (Fed. Cir. 2007). The Applicant respectfully submits the term "high speed image" would be readily understood by one of ordinary skill in the art as identifying a *type* of imaging, not as a term of degree. Nonetheless, even if "high speed" is construed as a term of art, the specification provides sufficient detail to ascertain the metes and bounds of the claims.

A. "High Speed" is a Type of Imaging not a Degree of Imaging

Claim construction begins with the words in the claims which are examined from the perspective of one of ordinary skill in the art. (*Tegal Corp. v. Tokyo Electron AM. Corp.*, 257 F.3d 1331, 1342 (Fed. Cir. 2001). In the absence of express intent to impart a novel meaning to a term, the words take on the ordinary and customary meanings. (*Teleflex, Inc. v. Ficossa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). The ordinary meaning may be ascertained from a variety of sources such as dictionaries and treatises. (*Texas Digital Systems, Inc. v. Telegenix, Inc.*, 308 F.3d 1193, 1202 (Fed. cir. 2002).

1. Ordinary Meaning of "High Speed Imaging"

The claims recite a "high speed imager" and "high speed imaging." While the Board determined that "high speed" was a term of degree, the Applicants respectfully submit that the term would be considered by one of ordinary skill in the art to identify a *type* of imaging or imager. This is evident by considering the same resources used to construe the ordinary meaning of the term.

Wikipedia identifies "High Speed Photography" as "the science of taking pictures of very fast phenomena." (Wikipedia, the free encyclopedia, *High speed photography,*

Internet Article, [Online] 2000, Retrieved from the Internet: http://en.wikipedia.org/wiki/High_speed_photography >[retrieved on 2008-04-08], 7 pages, provided in the Information Disclosure Statement submitted herewith). A term which identifies a "science" is not properly understood to be a term of degree. Rather, a "science" is "a branch of knowledge or study dealing with a body of facts or truths systematically arranged and showing the operation of general laws: the mathematical sciences." *Dictionary.com Unabridged* (v 1.1), Based on the Random House Unabridged Dictionary, © Random House, Inc. 2006.

Within the branch of photography identified as "high speed," Wikipedia notes that:

> In common usage, high speed photography may refer to either or both of the following meanings. The first is that the photograph itself may be taken in a way as to appear to freeze the motion, especially to reduce motion blur. The second is that a series of photographs may be taken at a high sampling frequency or frame rate. The first requires a sensor with good sensitivity and either a very good shuttering system or a very fast strobe light. The second requires some means of capturing successive frames, either with a mechanical device or by moving data off electronic sensors very quickly.

Thus, one of ordinary skill in the art, depending upon the context, would understand "high speed imaging" to refer to either the imaging methods used to "freeze" a moving subject, or to imaging methods used to provide a number of consecutive images obtained at a high rate, or both.

As noted above, the proper context for ascertaining the meaning of a term is the specification. The system described in the Applicant's specification in at page 10, lines 3-18 includes a "high speed camera." This system is at least capable of "freezing" a moving subject and could also provide a number of consecutive images. The system described at page 10, line 19 through page 11, line 11, uses a short pulse of coherent

light. This system is capable of freezing a moving subject. The system described at page 11, line 12 through page 12 line 6 incorporates a fast strobe light. A strobe light may be used to acquire a single image, thereby freezing the subject, although a number of images may be obtained in a short period of time to provide a time-lapse effect. Therefore, one of ordinary skill in the art, in considering the systems disclosed within the Applicant's specification, would understand a "high speed imager" to be an imager that is at least capable of freezing the motion of a moving object, although all of the foregoing meanings are also supported.

Additionally, the Applicant's specification states that "[t]ypically, the semiconductor wafer surface is moving at a radial velocity that translates to up to a few hundred linear feet per minute" during the CMP process. As a result, "conventional image capturing (optical) systems will not capture a sharp image." (Applicant's specification at page 4, lines 22 to page 5, line 1). Therefore, one of ordinary skill in the art, in considering the problems in the prior art disclosed within the Applicant's specification, would understand a "high speed imager" to be an imager that is at least capable of freezing the motion of a moving object.

Finally, the imager is disclosed as being used to "read" the vias in the substrate. (See, e.g., page 8, line 21 through page 9, line 2). Accordingly, while a series of consecutive frames (video) can be used to "read" the presence of a via, a single image may also be used to "read" the presence of a via. Therefore, one of ordinary skill in the art, in considering the purpose for which the image is acquired in accordance with the Applicant's specification would understand a "high speed imager" to be an imager that is at least capable of freezing the motion of a moving object by obtaining at least a single image.

Therefore, those of ordinary skill in the art understand "high speed imaging" to refer to a specific type of imaging system which is capable, at least, of freezing the motion of a moving subject. Furthermore, the term "high speed imaging" as used in the claims and the Applicant's specification would be understood by one of ordinary skill in the art to refer to an imaging system capable of obtaining at least one image in a way as to appear to freeze the motion, especially to reduce motion blur, of a substrate during a CMP process even when the substrate is moving at speeds of up to a few hundred feet per second.

2. Reference Materials Support The Ordinary Meaning

Reference materials available in the applicable art support the argument that the term "high speed" is used to identify a type of photography, not merely as a term of degree. One such reference is AARON SUSSMAN, *The Amateur Photographer's Handbook*, pp. 6, 286-290, (8th ed. 1973), Thomas Y. Crowell Company, Inc., (1941), cited pages of which are provided in the Information Disclosure Statement submitted herewith.

Sussman notes that the first attempt at "*high-speed*, or *stroboscopic*, photography" photography occurred in 1851 when an electric spark was used in a darkened room to illuminate a spinning wheel while the shutter of a camera was fully open. (Sussman at page 6, emphasis in original). Thus, Sussman uses the term "high speed" to identify a *type* of photography, not as a word of degree.

Sussman goes on to describe the acquisition of "high speed exposures" obtained using fast shutter speeds. (Sussman at page 287). Sussman further provides a formula

for identifying the requisite exposure for an object moving across the field of a camera. Specifically:

$$E = \frac{D}{100F \times S}$$

wherein

"E" is the exposure;

"D" is the distance of the object in feet from the camera;

"F" is the focal length of the lens; and

"S" is the speed of the object in feet per second. (Sussman at page 288).

Thus, the exposure obtained using the branch of photography identified by those of ordinary skill in the art as "high speed photography" is identified as a specific type of exposure, namely, a "high speed exposure."

Therefore, Sussman provides additional evidence supporting the conclusion that the term "high speed" would be understood by one of ordinary skill in the art as identifying a particular type of photography wherein an imaging system is designed to "freeze" an object in motion.

3. "High Speed" as Used in Technical Papers

Technical papers further buttress the argument that "high speed" is understood by those of ordinary skill in the art to identify a specific type of image or imaging system, not merely as a term of degree. CHEN ET AL., *Optimal Scheduling of Capture Times in*

a Multiple Capture Imaging System, The International Society for Optical Engineering, Proc. SPIE Vol. 4669, (2002) ©2002 SPIE, pp. 288-296, identifies "high speed imaging" as keywords. ABIDI ET AL., *Facet Model and Mathematical Morphology for Surface Characterization*, The International Society for Optical Engineering, Proc. of SPIE Conf. on Intelligent Robots and Computer Vision XVIII: Algorithms, Techniques, and Active Vision, Vol. 3837, pp. 334-344, Boston, MA September 1999 describes other researchers as using "high-speed imaging" in conducting research. One paper, WOLFE ET AL., *High Speed Imaging Polarimeter*, The International Society for Optical Engineering, Proc. of SPIE Vol. 5158, 2003, Bellingham, WA, pp. 24-32, uses the term "high speed" in the title of the paper.

Thus, the foregoing technical papers use "high speed imaging" to identify a *type* of imaging, not merely to provide a relative value. Accordingly, the term "high speed" as used in the Applicant's specification would be understood by one of ordinary skill in the art as identifying a particular type of photography wherein an imaging system is designed to "freeze" an object in motion.

4. "High Speed" as Used in Patents

The term "high speed" is also found in various patents to identify a particular *type* of system. By way of example, U.S. Patent No. 6,374,053 issued to Raposa et al., which was filed on April 28, 2000, recites a "high speed photography system" which incorporates a camera and a strobe light. (See, e.g., '053 patent at claim 1 and column 4, lines 16-19). This system is similar to the system disclosed in the Applicant's specification at page 11, line 12 through page 12 line 6. Similarly, U.S. Patent No. 2,408,764 issued to Edgerton on October 8, 1946 describes "High-Speed Flash

Photography" which uses synchronized flashes of light units to expose a film through a camera with a slow shutter. (See also, U.S. Patent No. 6,229,272, issued to Root on May 8, 2001, filed September 24, 1999).

Additionally, U.S. Patent No. 4,745,608 issued to Aulds et al. on May 17, 1988 describes the use of a laser and a shutterless camera to provide high-speed photography. Similarly, the system disclosed in the Applicant's specification at page 10, line 19 through page 11, line 11, uses a short pulse of coherent light. U.S. Patent No. 6,248,995 issued to Tanaami et al. on June 19, 2001, which was filed on May 15, 1998, discloses the use of a "high speed camera" to obtain images. Similarly, the system disclosed in the Applicant's specification in at page 10, lines 3-18 includes a "high speed camera."

Accordingly, a review of various patents filed at about the same time as the Applicant's specification or publicly available at that time, use the term "high speed" to identify a specific type of photography, not as a term of degree. Therefore, the term "high speed" would be understood by one of ordinary skill in the art as identifying a particular type of photography wherein an imaging system is designed to "freeze" an object in motion.

5. The Commonly Understood Meaning is Not Redefined

Finally, the use of the term "high speed" in the Applicant's specification is consistent with the customary meaning that would be ascribed to that term by one of ordinary skill in the art. As discussed above, the Applicant's specification disclosed several systems for obtaining high speed images. Each of those systems is reflected in the as discussed above. Therefore, the Applicant's specification does not ascribe a

meaning to the term "high speed" that is contrary to the ordinary and customary meaning of that term as understood by one of ordinary skill in the art.

6. Conclusion

Therefore, the term "high speed imaging" identifies a branch of photography which is directed to obtaining images of subject matter that is in motion. Thus, "high speed" is not a term of degree. Rather, one of ordinary skill in the art, in the context of the Applicant's specification and claims, would understand the term "high speed imager" to refer to an imaging system capable of obtaining at least one image in a way as to appear to freeze the motion, especially to reduce motion blur, of a substrate during a CMP process even when the substrate is moving at speeds of up to a few hundred feet per second.

B. The Specification and the Claims Provide Metes and Bounds

Even if "high speed" was not used by those of ordinary skill in the art to identify an imaging system capable of obtaining at least one image in a way as to appear to freeze the motion, especially to reduce motion blur, of a subject, the information available in the Applicant's specification is sufficient to identify the metes and bounds of the claims. Specifically, while the specification does not include a single sentence which positively recites every aspect of a system that provides a "high speed image," sufficient parameters are provided to enable one of ordinary skill in the art to practice the invention as well as to discriminate between the invention as claimed and the prior art.

For example, the Applicant's specification notes that the invention relates to "thickness detection systems used during the chemical-mechanical polishing of an

integrated circuit." (Applicant's specification at page 1, lines 7-9). Additionally, a problem in determining end-point during the polishing is the fact that the wafer surface is moving at up to a few hundred linear feet per minute. (Applicant's specification at page 4, lines 20-22). This frames the context in which the Applicant's invention is disclosed.

The system disclosed in one embodiment of the Applicant's invention rotates a substrate at up to a few hundred linear feet per minute. (Applicant's specification at page 7, lines 18-20). Additionally, the feature(s) which is/are used to identify the extent of polishing may be the vias in the wafer. (Applicant's specification at page 8, line 17 through page 9, line 2). The image, as disclosed in the Applicant's specification, is to be obtained by a system located "just inside or outside of the polishing pad 22." (Applicant's specification at page 9, lines 22-23).

Therefore, the specification identifies the size of the characteristics that need to be recognized, the speed up to which the wafer is moving and the environment in which the image is to be obtained. Additionally, as discussed above, three different system approaches are identified which may be used to obtain the requisite image. Accordingly, all of the information needed to apply the formula of Sussman is set forth (the focal length of the lens being a function of the particular camera selected).

Moreover, an imaging system which does not provide the ability to obtain an image of a substrate that is being rotated pursuant to a CMP polishing operation with sufficient clarity to identify a feature on the wafer that can be used to identify an end point is clearly excluded by the claims recited in the Applicant's specification.

Therefore, the embodiments disclosed in the Applicant's specification combined with the knowledge of one of ordinary skill in the art is sufficient to both enable others to

practice the Applicant's invention as well as to inform one of ordinary skill in the art as to the metes and bounds of the Applicant's claims.

C. Conclusion

Therefore, "high speed" is not a term of degree. Rather, "high speed" identifies a particular branch of imagery, the principles of which can be used to define a specific imaging system that can obtain the images as recited in the claims. Moreover, even if "high speed" was not used by those of ordinary skill in the art to identify an imaging system capable of obtaining at least one image in a way as to appear to freeze the motion, especially to reduce motion blur, of a subject, the information available in the Applicant's specification is sufficient to identify the metes and bounds of the claims.

IV. Conclusion

Applicant respectfully requests entry of the amendments and favorable consideration of the application.

A prompt and favorable action on the merits is requested.

Respectfully Submitted,
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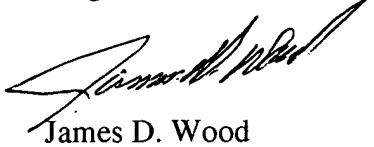

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